INTRODUCTION

This handout is a companion to the two videos, Integrating Technology Into a Preschool Classroom and Create a Maker Mindset to Support Early STEM, created in collaboration with the Idaho STEM Action Center and the Boise State University College of Education. Loris Malaguzzi, founder of the Reggio Emilia approach, discussed that children have the ability to express themselves in infinite ways. In fact, he stated that children express themselves in over 100 languages and "they have multiple ways of seeing and multiple ways of being"[1]. Early childhood educators nurture and cultivate children's unique and varied languages of self-expression and discovery by:

- Shifting to a maker mindset to honor the 100 Languages of Children[1]
- Providing a variety of high tech and low tech tools for expression of these languages
- Introducing coding as yet another language through which children can express their ideas and creativity

A MAKER MINDSET

Dale Dougherty describes a maker mindset as creating without rules or constraints[2]. He states that "making is a source of innovation" and makers experiment with materials by taking them apart and thinking of new ways that they could fit together. Therefore, shifting to a maker mindset in early childhood means that educators provide not only interesting materials and tools, they allow children the freedom to manipulate them in a variety of ways that involve tinkering, making, and breaking.

- Tinkering - improving something by making changes to it; attempting to repair or improve something with no guide or instructions
- Making - transforming materials to create something new and inventive
- Breaking - deconstructing or taking things apart to see how things work (e.g. taking apart an old computer or a broken printer)

1: Reggio Emilia Approach: Empowering Children In Their Learning Process. Retrieved from https://reggioemilia2015.weebly.com/the-100-languages.html
2: Dougherty, D. (2012). The maker movement. *Innovations, 7* (3), 11-14. Retrieved from this site
3: Bidart, F. (2014). Three poems from StarDust. Retrieved from https://pen.org/three-poems-from-star-dust/
4: Waters, V. & Lim, C. (2021). Asking open-ended questions. STEMIE, Retrieved from this site
5: Victoria State Department (2020). Literacy Teaching Toolkit. Writing with Children. Retrieved from this site
6: Daly, L. & Beloglovsky, M. (2014). Loose parts: Inspiring play in young children. *RedLeaf Press*. St. Paul, MN.
7: Gull, C., Bogunovich, J., Levenson Goldstein, S., & Rosengarten, T. (2019). Definitions of loose parts in early childhood outdoor classrooms: A scoping review. *The International Journal of Early Childhood Environmental Education,* 6(3), 37-52. Retrieved from https://files.eric.ed.gov/fulltext/EJ1225658.pdf
8: DevTech Research (n.d.). Coding as another language (CAL). Retrieved from this site

Making the shift: For early childhood educators looking to move beyond the maker space to a maker mindset, they too need the time and freedom to tinker, make, and break ("We are creatures who need to make"[3]). Try spending 10 minutes of a staff meeting exploring and creating with a variety of materials and tools or trying out new technologies. During your explorations, keep a child-centered approach and think of ways to intentionally plan the materials you put out and open-ended questions[4] you could pose to extend children's thinking and problem solving skills.

Reimagining the art area: Art is the written language of young children[5] and the evidence of their research as they make meaning of their world. The creation of visual and performing arts (dance and music) encompass elements of the scientific process, the engineering design process, and algorithms of math. When shifting to a maker mindset, intentionally plan your learning spaces to include art, music, and movement, in addition to spaces that allow children to tinker, make, and break with loose parts.

Image from Gull et al. (2019), p. 37

Providing access to loose parts[6,7]: Loose parts are open-ended materials either found in nature (e.g. leaves and pine cones.) or are everyday items found at home (e.g. boxes and milk caps). Young children experiment, combine, and take apart these items as they explore their curiosities during play. Loose parts can be choking hazards for younger children, so please make certain that the materials are large enough and safe for your children to manipulate. Here are some ideas from Kodo Kids for developmentally appropriate loose parts for all ages.

PROVIDE A VARIETY OF HIGH TECH AND LOW TECH TOOLS FOR CREATING

Technology is defined as a tool that helps solve a problem. It comes in both high tech and low tech varieties that children and adults use in their everyday lives. When adults allow children to use real tools such as hammers, screwdrivers, and sanders (with demonstration of proper usage and adequate supervision), it reinforces to children that they are capable, competent, and active agents in their learning. It also demonstrates a sense of trust between the adult and child by implicitly saying, "I trust you to use these tools appropriately."

Examples of high tech tools

- Electric tools such as an electric screwdriver
- Green screen and tablet for interesting backgrounds for performing arts
- Camera to capture their interests and curiosity
- Handheld microscope

Examples of low tech tools (this list is endless. . .)

- Crayons, markers, pens, pencils, and erasers
- Scissors
- Tweezers
- Low temperature glue gun
- Painter's tape

CODING IS A LANGUAGE THROUGH WHICH CHILDREN CAN EXPRESS THEIR CREATIVITY

While coding is traditionally taught and categorized under the STEM disciplines as an essential skill of the 21st century, Marina Umashi Bers and her DevTech Research Group[8] have found that young children learn to code best when educators introduce coding as learning another language. This Coding as Another Language (CAL) approach recognizes that, like the Spanish or Japanese language, coding is a symbol system through which young children communicate and express their creativity as they make meaning of their world. Bers and her team developed a curriculum that explores the linked practices of literacy and computer science by utilizing popular children's books, the KIBO robot, and ScratchJr. The KIBO is a screen-free coding robot that helps young children learn to code and express themselves. Other screen-free coding tools include: Cubetto, Botley the Coding Robot, Coding Critters™, and the Code & Go® Robot Mouse. Consult with local libraries to see if these are available to check out.